

LAPITEC S.P.A

TEST REPORT

SCOPE OF WORK

PHYSICAL PROPERTIES EVALUATION OF LAPITEC SINTERED STONE PANELS

REPORT NUMBER

K1433.01-106-31 R1

TEST DATES

11/25/19 - 04/28/20

ISSUE DATE	REVISED DATE
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09/10/20	12/15/20
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04/28/24

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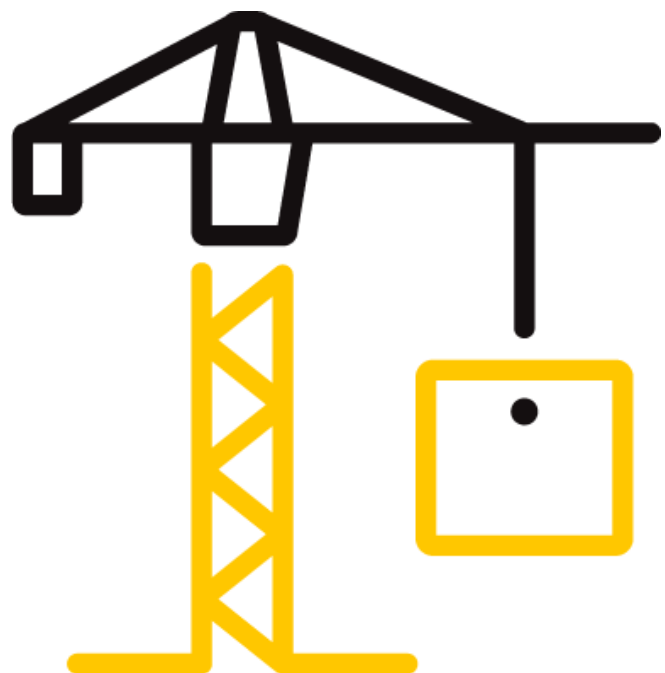
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Date: 09/10/20

REPORT ISSUED TO

LAPITEC S.P.A.

Via Bassanese, 6

VEDELAGO - TV, 31050

Italy

SECTION 1

SCOPE

Products: Sintered Stone Panels

Intertek Building & Construction (B&C) was contracted by Lapitec S.p.a. to evaluate the physical properties of their sintered stone panel products (designations: B. Assoluto Satin, B. Polare Satin, G. Piombo Satin, N. Antracite Satin, N. Assoluto Satin) in accordance with the test methods detailed in Section 2. Results obtained are tested values and were secured by using the designated test methods. Testing was conducted at the Intertek B&C test facility in York, Pennsylvania.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory.

For INTERTEK B&C:

COMPLETED BY:	Cooper F. Kennedy
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SECTION 2

TEST METHODS

The specimens were evaluated in accordance with the following:

ASTM C97-2018, *Standard Test Method for Absorption and Bulk Specific Gravity of Dimension Stone*

ASTM C1505-2015, *Standard Test Method for Determination of Breaking Strength of Ceramic Tiles by Three-Point Loading*

ASTM C170-2017, *Standard Test Method for Compressive Strength of Dimension Stone*

ASTM C1026-2013 (2018), *Standard Test Method for Measuring the Resistance of Ceramic and Glass Tile to Freeze-Thaw Cycling (300 Cycles)*

ASTM C648-2014, *Standard Test Method for Breaking Strength of Ceramic Tile*

ASTM C531-2018, *Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes*

ASTM C1353-2015, *Standard Test Method Using the Taber Abraser for Abrasion Resistance of Dimension Stone Subjected to Foot Traffic*

ANSI A137.1-2019 Section 9.3, *American National Standard Specifications for Ceramic Tile*

ASTM G155-2013, *Standard Test Method for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials*

ASTM C609-2007 (2019), *Standard Test Method for Measurement of Light Reflectance Value and Small Color Differences Between Pieces of Ceramic Tile.*

ASTM E136-2019, *Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C*

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SECTION 3

MATERIAL SOURCE

The materials were provided by Lapitec S.p.a. The following was received on October 10, 2020:

- **B. Assoluto Satin**
 - ASTM C97 - 5 Specimens each at 12mm, 20mm and 30mm thickness
 - ASTM 1505 - 10 Specimens each at 12mm, 20mm and 30mm thickness
 - ASTM C170 - 20 Specimens
 - ASTM C531 - 4 Specimens
 - ASTM C648 - 10 Specimens, each at 12mm, 20mm and 30mm thickness
 - ASTM C1026 - 5 Specimens
 - ASTM C531 - 5 Specimens
- **N. Antracite Satin**
 - ASTM E136 - 5 Specimens,
- **B. Polare Satin**
 - ASTM C1353 - 4 Specimens,
- **B. Assoluto Satin**
 - ASTM C609 / G155 - 6 Specimens,
- **G. Piombo Satin**
 - ASTM C609 / G155 - 6 Specimens,
- **N. Assoluto Satin**
 - ASTM C609 / G155 - 6 Specimens,

Refer to the product description photos in Section 9. The material was tested as received. Representative materials will be retained by Intertek B&C for a minimum of four years from the test completion date.

SECTION 4

LIST OF OFFICIAL OBSERVERS

NAME	COMPANY
Cooper F. Kennedy	Intertek B&C
Scott D. Scallorn	Intertek B&C

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SECTION 5**TEST PROCEDURES**

All conditioning of test specimens and test conditions were at standard laboratory conditions unless otherwise reported. Refer to the test related photos in Section 9.

ASTM C97 - Absorption/Density Evaluation

Water absorption and bulk specific gravity determinations were performed in accordance with the procedures detailed in ASTM C97. The test specimens were oven dried at 60°C for a period of 48 hours prior to cooling and weight determination as specified in Section 7.2. The specimens were then transferred to a water bath maintained at 22 ±2°C for a 48-hour immersion exposure. The post-immersion specimens were removed, surfaced dried, and re-weighed as detailed in Section 7.3. Immediately after post-immersion weighing of the specimens, they were suspended in a 22 ±2°C water bath under a digital balance (ICN: 003449) for determination of immersed weight. Water Absorption and Bulk Specific Gravity were calculated per the equations presented in Sections 8.1. and 11.1 respectively.

ASTM C1505 - Breaking Strength by Three-Point Loading

The breaking strength evaluation was performed on a SATEC Universal Testing Machine (ICN: Y002011) equipped with a 50,000-lb load cell (ICN: 88507A) in accordance with the procedures detailed in ASTM C1505. Ten specimens were tested, each in 12mm, 20mm, and 30mm thicknesses. Individual specimen dimensions were measured with a digital caliper (ICN: 01153). The specimens were individually supported at a span of 11.5 in. on 1.25 in. diameter support blocks with compressive load applied at the center point through a 1.25 in. diameter loading nose at a uniform stress rate of 1450 lbf/min for the 12mm thick specimens, 4000 lbf/min for the 20mm specimens and 9000 lbf/min for the 30 mm specimens until failure was observed. Ultimate failure load was recorded for calculation of Breaking Load and Modulus of Rupture. Results were averaged for each test series.

ASTM C170 - Compressive Strength Evaluation

Compressive Strength was determined in accordance with the procedures detailed in ASTM C170. The specimens were tested in both oven-dry and wet condition with load applied both parallel and perpendicular to the finish face. Specimen dimensions were measured with a digital caliper (ICN: 01153) and the load bearing surface calculated per Section 9.1. Per Section 8.1, dry condition specimens were oven-dried at 60°C for a period of 48 hours prior to cooling to room temperature and testing. Per Section 8.2, wet condition specimens were immersed in a 22 ±2°C water bath for a period of 48 hours prior to removal, surface drying and testing. Compressive load was applied to each specimen on a Forney model FT 40 DR Testing Machine (ICN: Y000143) at a rate of load maintained under 100 psi/s as called for in Section 9.3 until failure was observed. Compressive strength was calculated in accordance with Section 10.1 and averaged for both the wet and dry test series.

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ASTM C1026 - Freeze/Thaw Resistance Evaluation (15 Cycles)

The specimens were visually inspected for cracks and then oven-dried at $150 \pm 5^{\circ}\text{C}$ for 24 hours, cooled, and the dry weight was determined on a Mettler Toledo digital balance (ICN: 003449). The specimens were then transferred to a steel support rack in a freeze cycling tray situated within an ESPEC Environmental Conditioning Chamber (ICN: INT00535) and positioned to maintain a horizontal, face up specimen exposure that would allow for partial specimen immersion (at least half specimen depth but not submerged - per ASTM C1026, Section 7.1.3). The specimens were then subjected to a total of 15 freeze-thaw cycles wherein the chamber was ramped up and down in accordance with Section 7.1.5 (between -3°C and 5°C with the water pump engaging to pump in $16 \pm 11^{\circ}\text{C}$ water at the -3°C condition to facilitate the thawing process and disengaging at the 5°C condition). At the completion of cycling, the specimens were, again, oven dried as detailed above, re-weighed, and visually evaluated for cracking, disintegration, spalling, and other deleterious effects. Weight loss (%) was calculated in accordance with Section 8.1 for each specimen and averaged for the test series.

ASTM C648 - Breaking Strength Evaluation

Specimen thickness was measured with a digital caliper (ICN: 01153) prior to placement on a test fixture containing an equilateral triangle having 3 in. sides of flat-tipped support rods evenly spaced around a circumscribed circle having a 1.732 in. radius. Compressive load was applied to the center of the supported specimen through a 0.5 in. diameter, hardened spherical loading nose on a SATEC UTM (ICN: Y002011) equipped with a 50k load cell (ICN: 88507A) operating at a constant rate of 800 lbf/min until failure was observed. Applied force at break was recorded for each specimen and averaged for the test series.

ASTM C531 - Linear Coefficient of Thermal Expansion

Linear coefficient of thermal expansion was conducted in accordance with the procedures detailed in ASTM C531, Section 9. Specimens were measured on a linear change track (ICN: V002608) equipped with a digital depth gauge (ICN: 63646). After the initial length measurements were taken, the specimens were placed into an oven (ICN: 005621) for a minimum of 16 hours at 100°C . After specimens had been heated, they were removed one at a time and measured again. Percent shrinkage was then calculated.

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ASTM C1353 - Abrasion Resistance

The abrasion resistance evaluation was conducted on a Taber Industries 5130 Abraser (ICN: Y001522) in accordance with the procedures detailed in ASTM C1353. Per Section 8.1, the bulk specific gravity of the three nominal 4.0 in. square specimens was verified in accordance with ASTM C97 prior to oven-drying at $60 \pm 2^\circ\text{C}$ for 48 hours and testing for resistance to abrasion. Upon completion of the requisite oven conditioning and re-stabilization to $22 \pm 3^\circ\text{C}$, the pre-abrasion dry mass of each specimen was determined on a Mettler Toledo digital balance (ICN: 65216). Specimen thickness was determined with a digital caliper (ICN: 01153) at four points along the anticipated travel path of the abramer wheel and the results averaged for each specimen. The Taber Abraser machine applied a constant downward force of 1,000 grams to each of two H-22 Calibrade Taber Industries hard abrasive wheels, while the instrument recorded the number of wear cycles completed for each specimen as it rotated below the wheels. After the completion 1,000 cycles of abrasion, each specimen was removed from the abramer machine, brushed off and evaluated for wear by re-measurement of specimen depth at the four previously evaluated points, as well as re-weighed for determination of loss of both depth and mass. The Index of Abrasion was calculated in accordance with Section 9.1 and averaged for the test series.

ANSI 137.1/ASTM C609 - Color Uniformity

The color uniformity evaluation was conducted on a GretagMacbeth Color i5 spectrophotometer (ICN: 004725) with a diffuse spherical geometry and a xenon lamp, CIELAB color space, illuminant D65, and 10° observer in accordance with the procedures detailed in ASTM C609. Results were calculated as specified in ANSI 137.2, Section 9.3 (ASTM C609, section 10.3) and evaluated against the color difference performance criteria presented in ANSI 137.1, Table 6.

ASTM G155/ ASTM C609 - Xenon Arc Weathering Exposure and Color Shift

Initial color readings were recorded for each specimen using a GretagMacbeth Color i5 Spectrophotometer (ICN: 004725) with a diffuse spherical geometry and a xenon lamp, CIELAB color space, illuminant D65, and 10° observer. The specular component was included in the measurements. The luminous reflectance value was calculated as a CIE tristimulus value Y. After initial readings, the specimens were exposed to 500 hours of accelerated weathering per ASTM G155 Cycle 1 inside an Atlas Ci5000 Weatherometer (ICN: 63081) at an irradiance level of 0.35 W/m^2 at 340 nm wavelength. The conditioning chamber was controlled at 42°C , and the black panel thermometer was set to 63°C . Relative humidity was maintained at 50%. Borosilicate "S" type inner and outer filters were used to simulate normal daylight sun conditions. The specimens were exposed for 500 hours to a repeating cycle that consisted of 102 minutes of light at the 63°C black panel temperature then 18 minutes of light and water spray in which the air temperature was not controlled.

Following the 500-hour weathering supplemental color readings were recorded. The color change (ΔE) was calculated for each test specimen and averaged for each test series.

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ASTM E136 - Combustibility

The behavior of the porcelin, when exposed to 750°C for 30 minutes, was evaluated utilizing a Setckin Ignition Furnace Model CSI-88 (ICN: 62156) connected to a data acquisition unit (ICN: 63533) in a fire hood (ICN: 005985). The material was conditioned at 60°C for 48 hours in a Lindberg Blue M oven (ICN: 005316) prior to testing. The weight of each specimen was measured before and after exposure with a Mettler Toledo Model XP1203S balance (ICN: 65216).

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TEST SPECIMEN DESCRIPTIONS

ASTM TEST PROCEDURE	NUMBER OF SPECIMENS	NOMINAL SPECIMEN DIMENSIONS	PANEL DESIGNATION	VISUAL CHARACTERISTICS
ASTM C97 - Absorption / Specific Gravity	15 Total (5 at each thickness)	5 each at 203mm Sq. by 12mm, 20mm, or 30mm	B. Assoluto Satin	White Manufactured Stone
ASTM C1505 - Breaking Strength, 3-point Loading	30 Total (10 at each thickness)	10 each at 305mm Sq. by 12mm, 20mm, or 30mm	B. Assoluto Satin	White Manufactured Stone
ASTM C170 - Compressive Strength	20	30mm cubes	B. Assoluto Satin	White Manufactured Stone
ASTM C1026 - Freeze/Thaw	5	76mm Sq. by 12mm	B. Assoluto Satin	White Manufactured Stone
ASTM C648 - Breaking Strength Single-point Loading	30 (10 at each thickness)	299mm Sq. by 12mm, 20mm, or 30mm	B. Assoluto Satin	White Manufactured Stone
ASTM C531 - Thermal Expansion	4	30mm Sq. by 254mm long	B. Assoluto Satin	White Manufactured Stone
ASTM C1353 - Abrasion Resistance	4	100mm Sq. by 12mm	B. Polare Satin	White Manufactured Stone
ANSI 137.1, Section 9.3/ ASTM C609/ ASTM G155 - Xenon Arc Exposure and Color Readings	18 (6 of each color)	67mm by 143mm by 12mm	B. Assoluto Satin G. Piombo Satin N. Assoluto Satin	White Manufactured Stone Grey Manufactured Stone Black Manufactured Stone
ASTM E136 - Vertical Furnace	5	50mm by 38mm by 30mm	N. Antracite Satin	Black Manufactured Stone

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SECTION 7

TEST RESULTS

ASTM C97 - Absorption and Density - B. Assoluto Satin 12mm - White

SPECIMEN NO.	NOMINAL SPECIMEN VOLUME	MASS (g)			ABSORPTION (%)	BULK SPECIFIC GRAVITY	DENSITY (lb/ft ³)
		DRY	WET	IMMERSED			
1	30.208 in ³	1315.42	1315.42	780.18	0.00	2.46	153.42
2		1342.63	1342.63	798.32	0.00	2.47	153.99
3		1360.78	1360.78	811.93	0.00	2.48	154.78
4		1333.56	1333.56	793.79	0.00	2.47	154.23
5		1351.71	1351.71	802.86	0.00	2.46	153.75
Mean					0.00	2.47	154.04
Standard Deviation					0.00	0.01	0.51

ASTM C97 - Absorption and Density - B. Assoluto Satin 20mm - White

SPECIMEN NO.	NOMINAL SPECIMEN VOLUME	MASS (g)			ABSORPTION (%)	BULK SPECIFIC GRAVITY	DENSITY (lb/ft ³)
		DRY	WET	IMMERSED			
1	50.368 in ³	2032.09	2032.09	1202.02	0.00	2.45	152.83
2		2059.31	2059.31	1215.63	0.00	2.44	152.38
3		2059.31	2059.31	1215.63	0.00	2.44	152.38
4		2068.38	2068.38	1215.63	0.00	2.43	151.42
5		2086.53	2086.53	1229.24	0.00	2.43	151.94
Mean					0.00	2.44	152.19
Standard Deviation					0.00	0.01	0.53

ASTM C97 - Absorption and Density - B. Assoluto Satin 30mm - White

SPECIMEN NO.	NOMINAL SPECIMEN VOLUME	MASS (g)			ABSORPTION (%)	BULK SPECIFIC GRAVITY	DENSITY (lb/ft ³)
		DRY	WET	IMMERSED			
1	75.584 in ³	3120.72	3120.72	1850.66	0.00	2.46	153.39
2		3111.64	3111.64	1841.59	0.00	2.45	152.95
3		3138.86	3138.86	1864.26	0.00	2.46	153.74
4		3075.36	3075.36	1823.44	0.00	2.46	153.36
5		3111.64	3111.64	1846.12	0.00	2.46	153.50
Mean					-0.12	2.46	153.57
Standard Deviation					0.16	0.01	0.46

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ASTM C1505 - Breaking Strength at Three-Point Load - B. Assoluto Satin 12mm - White

SPECIMEN DETAILS		DIMENSIONS (mm)		PEAK LOAD (N)	BREAKING LOAD (N)	MODULUS OF RUPTURE (N/mm ²)
SERIES	NO.	WIDTH	THICKNESS			
12 mm	1	304.80	13.27	6,389.9	5,857.4	49.9
	2	304.88	13.04	6,302.8	5,776.0	51.0
	3	304.85	12.84	5,812.7	5,327.4	48.5
	4	304.82	13.35	5,848.2	5,360.5	45.1
	5	305.86	13.56	6,614.5	6,042.3	49.3
	6	304.90	13.06	5,992.9	5,491.7	48.3
	7	304.72	13.19	6,741.8	6,181.6	53.3
	8	304.90	13.42	6,603.6	6,051.3	50.4
	9	304.96	12.83	6,588.8	6,036.6	55.0
	10	305.24	13.28	5,874.5	5,377.2	45.7
Average				6,277.0	5,750.2	49.7
Std. Dev.				363.5	332.1	3.1

ASTM C1505 - Breaking Strength at Three-Point Load - B. Assoluto Satin 20mm - White

SPECIMEN DETAILS		DIMENSIONS (mm)		PEAK LOAD (N)	BREAKING LOAD (N)	MODULUS OF RUPTURE (N/mm ²)
SERIES	NO.	WIDTH	THICKNESS			
20 mm	1	304.94	20.79	11,413.4	10,457.5	36.3
	2	305.07	20.28	12,326.4	11,289.2	41.2
	3	304.8	20.96	11,478.9	10,522.3	35.9
	4	304.91	20.36	12,456.0	11,413.8	41.3
	5	305.27	21.02	13,671.3	12,512.7	42.5
	6	304.93	20.50	12,723.6	11,658.3	41.6
	7	304.71	20.03	12,604.6	11,557.6	43.2
	8	304.85	20.43	13,019.5	11,932.6	42.9
	9	305.1	20.51	12,421.0	11,374.7	40.6
	10	305.05	20.45	13,428.6	12,299.5	44.1
Average				12,554.3	11,501.8	41.0
Std. Dev.				730.1	665.9	2.8

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ASTM C1505 - Breaking Strength at Three-Point Load - B. Assoluto Satin 30mm - White

SPECIMEN DETAILS		DIMENSIONS (mm)		PEAK LOAD (N)	BREAKING LOAD (N)	MODULUS OF RUPTURE (N/mm ²)
SERIES	NO.	WIDTH	THICKNESS			
30 mm	1	305.27	34.02	31,668.3	28,984.6	37.6
	2	305.36	30.77	37,292.1	34,121.7	54.1
	3	304.99	31.02	26,347.8	24,137.1	37.6
	4	304.78	30.53	32,622.9	29,906.3	48.1
	5	305.01	30.50	30,742.8	28,161.5	45.4
	6	305.06	30.71	31,623.7	28,963.7	46.1
	7	305.12	30.77	30,809.7	28,212.6	44.7
	8	303.13	30.30	29,752.4	27,423.3	44.8
	9	304.56	31.10	33,483.5	30,717.4	47.6
	10	304.79	30.96	28,875.1	26,469.7	41.4
Average				31,321.8	28,709.8	44.7
Std. Dev.				2,906.1	2,646.2	5.0

ASTM C170 - Compressive Strength - B. Assoluto Satin- White

SPECIMEN DETAILS		LOADING AREA (in ²)	FAILURE LOAD (lb _f)	COMPRESSIVE STRENGTH (psi) ¹
TEST CONDITION	NO.			
Dry Specimens Tested - Perpendicular to Finish Face	Dry - 1	1.389	99,460	71,600
	Dry - 2	1.381	84,450	61,200
	Dry - 3	1.381	95,000	68,800
	Dry - 4	1.376	93,620	68,000
	Dry - 5	1.391	87,100	62,600
Dry Specimens Tested - Parallel to Finish Face	Dry - 6	1.404	45,920	32,700
	Dry - 7	1.403	87,380	62,300
	Dry - 8	2.066	48,870	23,700
	Dry - 9	1.409	103,270	73,300
	Dry - 10	1.401	42,040	30,000
AVERAGE		1.460	78,711	55,400

¹ Compressive Strength results as presented have been rounded to the nearest 100 psi.

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ASTM C170 - Compressive Strength B. Assoluto Satin - White

SPECIMEN DETAILS		LOADING AREA (in ²)	FAILURE LOAD (lb _f)	COMPRESSIVE STRENGTH (psi) ¹
TEST CONDITION	NO.			
Wet Specimens Tested - Perpendicular to Finish Face	W-1	1.392	103,050	74,000
	W-2	1.392	20,680	14,900
	W-3	1.382	20,400	14,800
	W-4	1.384	14,990	10,800
	W-5	1.383	33,520	24,200
Wet Specimens Tested - Parallel to Finish Face	W-6	1.406	24,140	17,200
	W-7	1.409	12,210	8,700
	W-8	1.402	10,540	7,500
	W-9	1.410	117,370	83,200
	W-10	1.404	11,350	8,100
AVERAGE		1.396	36,825	26,300

¹ Compressive Strength results as presented have been rounded to the nearest 100 psi.

ASTM C1026 - Freeze Thaw Cycling - N. Assoluto Satin - Black

SPECIMEN NO.	DRY MASS (g)		WEIGHT LOSS		POST 15 CYLCE EXPOSURE VISUAL OBSERVATIONS
	INITIAL	POST EXPOSURE	(g)	(%)	
1	186.647	186.644	0.003	-0.00161%	Unaffected
2	187.315	187.314	0.001	-0.00053%	Unaffected
3	183.467	183.466	0.001	-0.00055%	Unaffected
4	183.433	183.430	0.003	-0.00164%	Unaffected
5	185.734	185.732	0.002	-0.00108%	Unaffected
Mean	185.319	185.317	0.002	-0.00108%	

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ASTM C648 - Breaking Strength Evaluation - B. Assoluto Satin 12 mm - White

SPECIMEN DETAILS		DIMENSIONS (in)			BREAKING STRENGTH (lb _f)
SERIES	NO.	LENGTH	WIDTH	DEPTH	
12 mm	A-1	9.0	9.0	0.526	1,145.9
	A-2	9.0	9.0	0.523	1,487.4
	A-3	9.0	9.0	0.522	1,281.4
	A-4	9.0	9.0	0.508	1,254.0
	A-5	9.0	9.0	0.521	1,337.5
	A-6	9.0	9.0	0.517	1,251.7
	A-7	9.0	9.0	0.526	1,215.7
	A-8	9.0	9.0	0.537	1,322.7
	A-9	9.0	9.0	0.535	1,195.5
	A-10	9.0	9.0	0.515	1,443.1
Average					1,293.5
Std. Dev.					107.3

ASTM C648 - Breaking Strength Evaluation - B. Assoluto Satin 20 mm - White

SPECIMEN DETAILS		DIMENSIONS (in)			BREAKING STRENGTH (lb _f)
SERIES	NO.	LENGTH	WIDTH	DEPTH	
20 mm	B-1	9.0	9.0	0.787	2,600.0
	B-2	9.0	9.0	0.798	2,791.2
	B-3	9.0	9.0	0.794	3,326.0
	B-4	9.0	9.0	0.790	2,983.4
	B-5	9.0	9.0	0.801	2,927.7
	B-6	9.0	9.0	0.784	2,883.3
	B-7	9.0	9.0	0.789	3,415.2
	B-8	9.0	9.0	0.782	2,901.6
	B-9	9.0	9.0	0.813	3,219.0
	B-10	9.0	9.0	0.803	3,471.3
Average					3,051.9
Std. Dev.					289.5

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ASTM C648 - Breaking Strength Evaluation - B. Assoluto Satin 30 mm - White

SPECIMEN DETAILS		DIMENSIONS (in)			BREAKING STRENGTH (lb _f)
SERIES	NO.	LENGTH	WIDTH	DEPTH	
30 mm	C-1	9	9	1.203	8,385.5
	C-2	9	9	1.202	9,540.4
	C-3	9	9	1.210	8,953.8
	C-4	9	9	1.204	9,350.9
	C-5	9	9	1.200	9,857.6
	C-6	9	9	1.209	8,941.2
	C-7	9	9	1.207	8,104.6
	C-8	9	9	1.196	9,544.0
	C-9	9	9	1.209	9,457.5
	C-10	9	9	1.204	9,040.2
Average					9,117.6
Std. Dev.					548.1

ASTM C531 - Linear Shrinkage and Thermal Expansion - B. Assoluto Satin - White

SPECIMEN	COMBINED LENGTH OF BAR AND READING (in)			LINEAR COEFFICIENT OF THERMAL EXPANSION (in/in/°F)
	LOW TEMP CONDITION	HIGH TEMP CONDITION	CHANGE	
1	10.0015	10.0055	0.0040	2.92E-06
2	9.9930	9.9970	0.0040	2.92E-06
3	9.9950	9.9995	0.0045	3.29E-06
4	10.0010	10.0050	0.0040	2.92E-06
Mean	9.9976	10.0018	0.0041	3.01E-06

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ASTM C1353 - Abrasion Resistance - B. Polare Satin - White

SPECIMEN NO.	MASS (g)			INDEX OF ABRASION
	INITIAL	POST-CYCLING	LOSS	
1	321.39	321.05	0.34	267.0
2	320.62	320.22	0.40	226.9
3	321.31	320.99	0.32	280.2
Series Mean				258.0

ASTM C1353 - Abrasion Resistance - B. Polare Satin - White

SPECIMEN NO.	REVOLUTIONS COMPLETED	THICKNESS (in)		
		INITIAL	POST-CYCLING	LOSS
1	1,000	0.522	0.522	0.000
2		0.522	0.521	0.001
3		0.522	0.522	0.000
Series Mean		0.522	0.522	0.000

TEST REPORT FOR LAPITEC S.P.A

Report No.: K1433.01-106-31 R1

Date: 09/10/20

ANSI 137.1/ASTM C609 - Color Uniformity - B. Assoluto Satin - White

SPECIMEN DETAILS		COLOR MEASUREMENTS			COLOR DIFFERENCE FOR THE LOT (Judds)
SERIES	NO.	L*	a*	b*	
B. Assoluto Satin - White	B-1	96.05	-0.42	2.45	
	B-2	96.05	-0.5	2.45	
	B-3	96.01	-0.47	2.53	
	B-4	96.08	-0.53	2.49	
	B-5	96.1	-0.52	2.42	
Average		96.06	-0.49	2.47	
MIN		96.01	-0.53	2.42	0.02
MAX		96.10	-0.42	2.53	
ANSI A137.1, Table 6 Evaluation Result					Pass

ASTM G155 - Xenon Arc Weathering - 500 Hours - B. Assoluto Satin - White

EXPOSURE TIME	MATERIAL ID	SPECIMEN ID	VISUAL OBSERVATIONS
500 Hours	B. Assoluto Satin	B-1	No Visual Changes Observed
		B-2	No Visual Changes Observed
		B-3	No Visual Changes Observed
		B-4	No Visual Changes Observed
		B-5	No Visual Changes Observed

ASTM C609 - Post-Xenon Arc Weathering Exposure and Color Shift - B. Assoluto Satin - White

SPECIMEN ID	L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*
B-1	96.05	-0.42	2.45	0.09	-0.12	-0.09	0.20
B-2	96.05	-0.50	2.45	0.07	-0.01	-0.11	0.14
B-3	96.01	-0.47	2.53	0.08	-0.06	-0.16	0.22
B-4	96.08	-0.53	2.49	0.04	-0.02	-0.13	0.17
B-5	96.10	-0.52	2.42	0.01	-0.02	-0.09	0.11
Average				0.06	-0.05	-0.12	0.17

TEST REPORT FOR LAPITEC S.P.A

Report No.: K1433.01-106-31 R1

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ANSI 137.1/ASTM C609 - Color Uniformity - G. Piombo Satin - Grey

SPECIMEN DETAILS		COLOR MEASUREMENTS			COLOR DIFFERENCE FOR THE LOT (Judds)
SERIES	NO.	L*	a*	b*	
G. Piombo Satin - Grey	G-1	43.8	0.16	-1.37	
	G-2	43.65	0.22	-1.34	
	G-3	43.87	0.16	-1.37	
	G-4	43.68	0.25	-1.38	
	G-5	43.6	0.19	-1.31	
Average		43.72	0.20	-1.35	
MIN		43.60	0.16	-1.38	0.04
MAX		43.87	0.25	-1.31	
ANSI A137.1, Table 6 Evaluation Result					Pass

ASTM G155 - Xenon Arc Weathering - 500 Hours - G. Piombo Satin - Grey

EXPOSURE TIME	MATERIAL ID	SPECIMEN ID	VISUAL OBSERVATIONS
500 Hours	G. Piombo Satin	G-1	No Visual Changes Observed
		G-2	No Visual Changes Observed
		G-3	No Visual Changes Observed
		G-4	No Visual Changes Observed
		G-5	No Visual Changes Observed

ASTM C609 - Post-Xenon Arc Weathering Exposure and Color Shift - G. Piombo Satin - Grey

SPECIMEN ID	L*	a*	b*	ΔL*	Δa*	Δb*	ΔE*
G-1	43.80	0.16	-1.37	-0.13	-0.03	-0.06	0.12
G-2	43.65	0.22	-1.34	-0.12	-0.09	-0.07	0.17
G-3	43.87	0.16	-1.37	-0.22	-0.01	-0.14	0.22
G-4	43.68	0.25	-1.38	-0.11	-0.12	-0.08	0.22
G-5	43.60	0.19	-1.31	-0.16	-0.05	-0.19	0.28
Average				-0.15	-0.06	-0.11	0.20

TEST REPORT FOR LAPITEC S.P.A

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ANSI 137.1/ASTM C609 - Color Uniformity - N. Assoluto Satin - Black

SPECIMEN DETAILS		COLOR MEASUREMENTS			COLOR DIFFERENCE FOR THE LOT (Judds)
SERIES	NO.	L*	a*	b*	
N. Assoluto Satin - Black	N-1	27.18	0.68	0.27	
	N-2	27.14	0.66	0.17	
	N-3	27.18	0.72	0.1	
	N-4	27.07	0.76	0.13	
	N-5	27.11	0.67	0.2	
Average		27.14	0.70	0.17	
MIN		27.07	0.66	0.10	0.03
MAX		27.18	0.76	0.27	
ANSI A137.1, Table 6 Evaluation Result					Pass

ASTM G155 - Xenon Arc Weathering - 500 Hours - N. Assoluto Satin - Black

EXPOSURE TIME	MATERIAL ID	SPECIMEN ID	VISUAL OBSERVATIONS
500 Hours	N. Assoluto Satin	N-1	No Visual Changes Observed
		N-2	No Visual Changes Observed
		N-3	No Visual Changes Observed
		N-4	No Visual Changes Observed
		N-5	No Visual Changes Observed

ASTM C609 - Post-Xenon Arc Weathering Exposure and Color Shift - N. Assoluto Satin - Black

SPECIMEN ID	L*	a*	b*	ΔL^*	Δa^*	Δb^*	ΔE^*
N-1	27.18	0.68	0.27	-0.08	-0.04	-0.23	0.35
N-2	27.14	0.66	0.17	-0.03	-0.04	-0.19	0.29
N-3	27.18	0.72	0.10	-0.07	-0.08	-0.03	0.13
N-4	27.07	0.76	0.13	-0.05	-0.15	-0.09	0.26
N-5	27.11	0.67	0.20	-0.02	-0.07	-0.20	0.31
Average				-0.05	-0.08	-0.15	0.27

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ASTM E136, Sedalia HLB 1000

SPECIMEN	INITIAL TEMPERATURE (°C)			MAXIMUM TEMPERATURE (°C)		FINAL TEMPERATURE (°C)		
	SAMPLE CENTER	SAMPLE SURFACE	FURNACE	SAMPLE CENTER	SAMPLE SURFACE	SAMPLE CENTER	SAMPLE SURFACE	FURNACE
1	750	741	772	736	737	736	737	772
2	750	739	772	735	734	735	734	772
3	750	739	772	732	736	732	735	772
4	750	739	771	730	732	730	731	771
SPECIMEN	INITIAL MASS (g)	FINAL MASS (g)	MASS LOSS (g)	MASS LOSS (%)	SMOKE	IGNITION	COMMENTS	
1	133.451	133.444	0.007	0.005	None	None	No Changes	
2	132.876	132.871	0.005	0.004	None	None	No Changes	
3	134.713	134.647	0.066	0.049	None	None	Cracked/Fractured	
4	134.790	134.778	0.012	0.009	None	None	No Changes	

**SECTION 8
CONCLUSION**

The B. Assoluto Satin, G. Piombo Satin, and N. Assoluto Satin products satisfied the color uniformity requirement as presented in ANSI 137.1, Table 6 (≤ 3.0 Judds).

No performance requirements were specified for any other test component within the scope of this program, so results were reported as obtained.

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SECTION 9 PHOTOGRAPHS



Photo No. 1
Materials Testing Specimens - As Received



Photo No. 2
ASTM C97 Absorption Specimens - As Received

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Photo No. 3
ASTM C97 Absorption Testing



Photo No. 4
ASTM C1505 - Breaking Strength (3-point load) - Test Setup

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Photo No. 5

ASTM C1505 - Breaking Strength (3-point load) - Representative Failure



Photo No. 6

ASTM C170 - Compressive Strength Specimens - As Received

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Photo No. 7

ASTM C170 - Compressive Strength - Wet Condition Specimen Preconditioning



Photo No. 8

ASTM C170 - Compressive Strength - Oven-Dry Specimen Preconditioning

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Photo No. 9

ASTM C170 - Compressive Strength - Test Setup



Photo No. 10

ASTM C170 - Compressive Strength - Representative Failure

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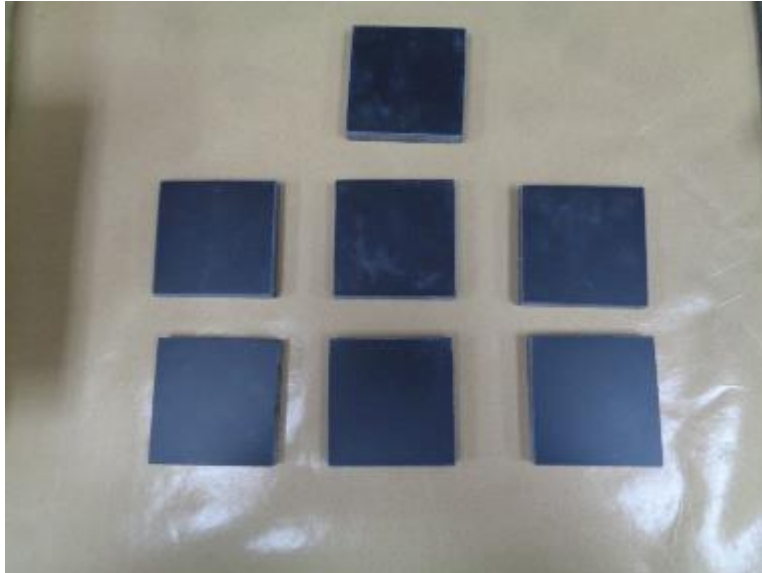


Photo No. 11

ASTM C1026 - Freeze/Thaw - Specimens as Received (12 mm Specimens)

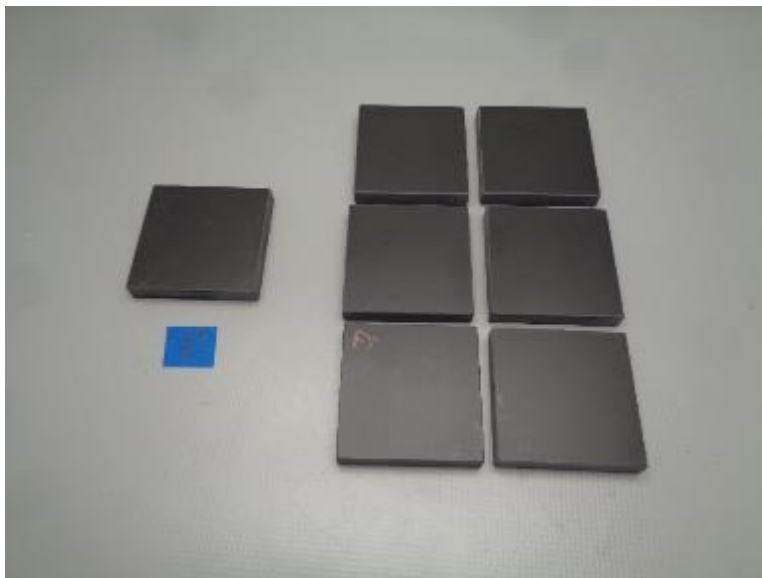


Photo No. 12

**ASTM C1026 - Freeze/Thaw - Post Exposure Cycling Results
(12 mm Specimens - Unaffected)**

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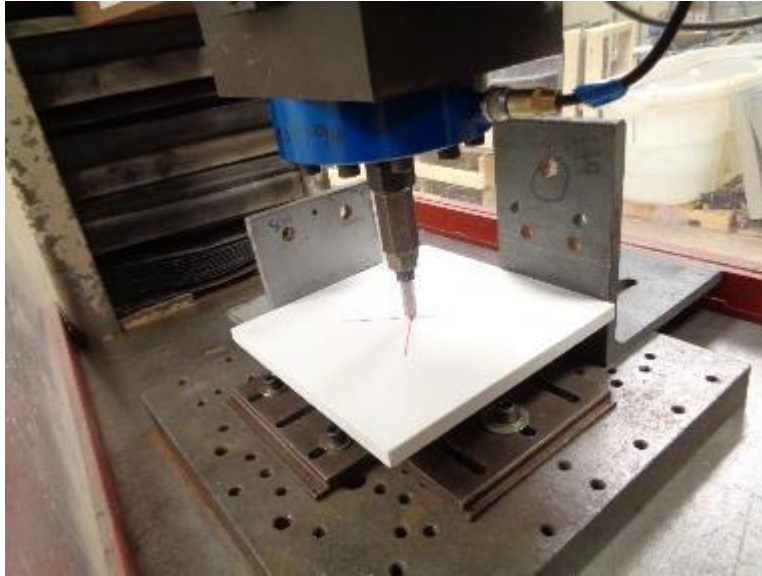


Photo No. 13

ASTM C648 - Breaking Strength - Test Setup



Photo No. 14

ASTM C648 - Breaking Strength - Test Setup

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Photo No. 15

ASTM C648 - Breaking Strength - Representative Failure



Photo No. 16

ASTM C648 - Breaking Strength - Representative Failure

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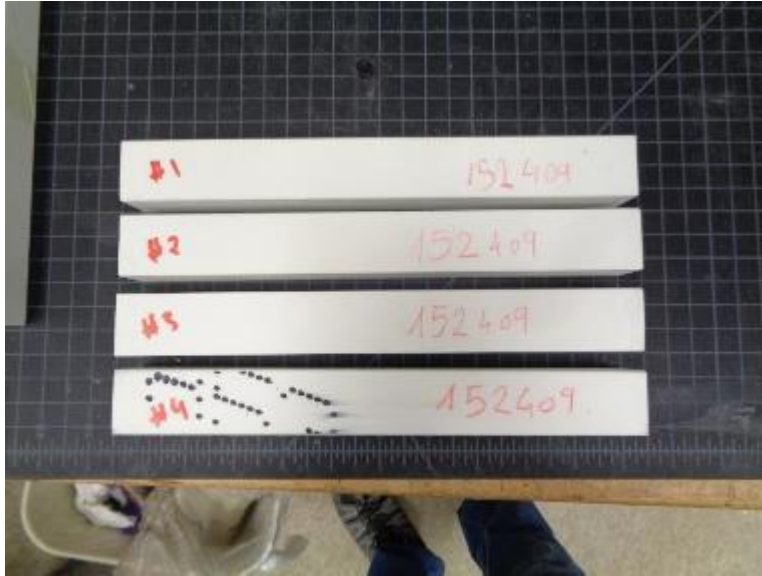


Photo No. 17

ASTM C531 - Coefficient of Thermal Expansion - Specimens as Received

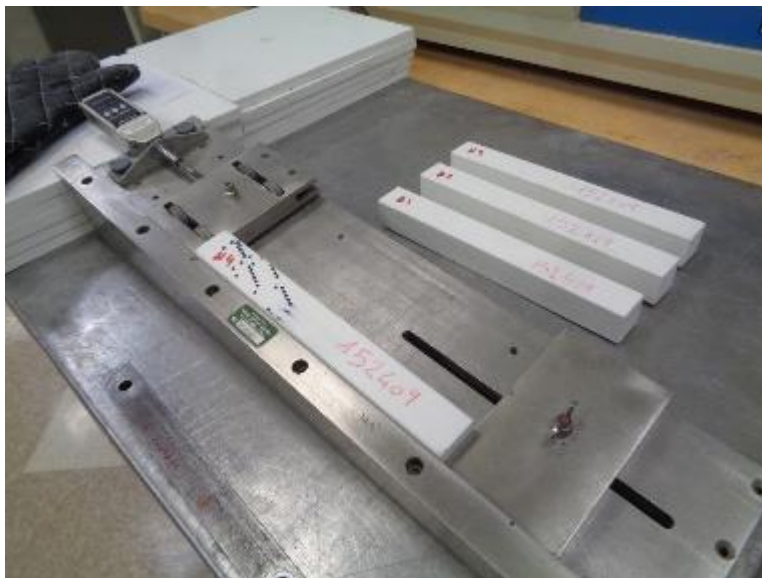


Photo No. 18

ASTM C531 - Coefficient of Thermal Expansion - Test in Progress

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Photo No. 19

ASTM C1353 - Abrasion Resistance Specimens - As Received



Photo No. 20

ASTM C1353 - Abrasion Resistance - Test Setup

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Photo No. 21

ASTM C1353 - Abrasion Resistance - Post Testing Results

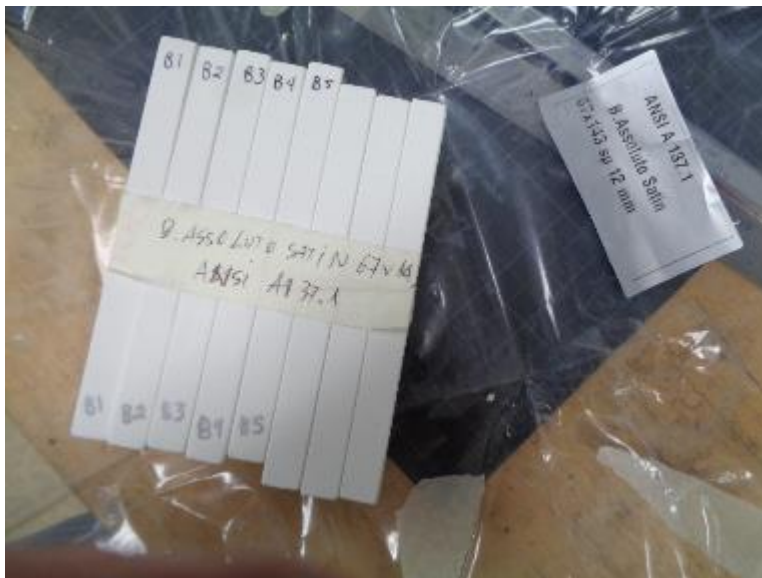


Photo No. 22

ASTM C609/G155 - Color Readings and Light Exposure Specimens - As Received

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Photo No. 23

ASTM C609/G155 - Color Readings and Light Exposure - Specimens as Received



Photo No. 24

ASTM C609/G155 - Color Readings and Light Exposure - Specimens as Received

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Photo No. 25

ASTM C609/G155 - Color Readings and Light Exposure - Specimen Testing

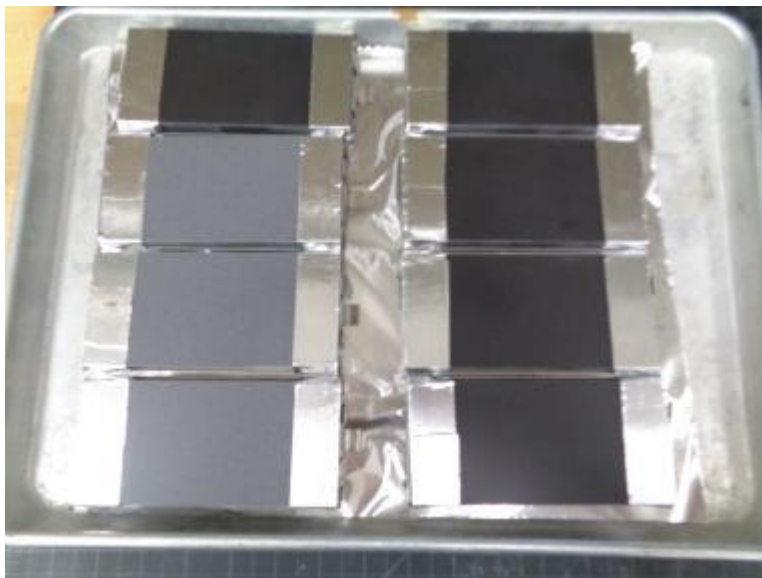


Photo No. 26

ASTM C609/G155 - Color Readings and Light Exposure - Post Cycling Specimen Condition

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Photo No. 27

ASTM C609/G155 - Color Readings and Light Exposure - Post Cycling Specimen Condition



Photo No. 28

ASTM E136 - Vertical Tube Furnace - Specimens as Received

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Photo No. 29

ASTM E136 - Vertical Tube Furnace - Pre-Exposure Test Specimens



Photo No. 30

ASTM E136 - Vertical Tube Furnace - Post Exposure Results

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SECTION 10

REVISION LOG

REVISION #	DATE	PAGES	REVISION
0	09/10/20	N/A	Original Report Issue
1	12/15/20	3, 4, 6, 9, 13, 26	Edited to more accurately reflect completed testing
		2, 4, 9, 18, 20,	Changed all instances of "Piambo" to "Piombo"